(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau





(43) International Publication Date 26 August 2004 (26.08.2004)

PCT

(10) International Publication Number WO 2004/072621 A1

(51) International Patent Classification⁷: E21B 33/13, G05D 11/13, G01F 1/84

G01N 9/00,

(21) International Application Number:

PCT/US2003/003564

- (22) International Filing Date: 5 February 2003 (05.02.2003)
- (25) Filing Language:

English

(26) Publication Language:

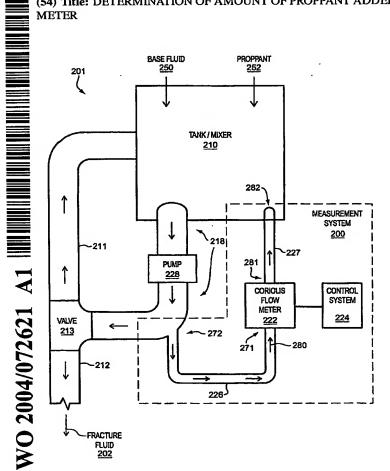
English

- (71) Applicant (for all designated States except US): MICRO MOTION, INC. [US/US]; 7070 Winchester Circle, Boulder, CO 80301 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): DUTTON, Robert, E. [US/US]; 1027 Willow Place, Louisville, CO 80027 (US). RUSSELL, Christopher, M. [US/US]; 13015 Dogwood Glen, Cypress, TX 77429 (US).

- (74) Agents: BORNSEN, Brett, L. et al.; Duft Setter Ollila & Bornsen LLC, 2060 Broadway, Suite 300, Boulder, CO 80302 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: DETERMINATION OF AMOUNT OF PROPPANT ADDED TO A FRACTURE FLUID USING A CORIOLIS FLOW METER



(57) Abstract: A measurement system (200) is disclosed comprising a Coriolis flow meter (222) and a control system (224). A base fluid (250) is first flowed through the Coriolis flow meter. The Coriolis flow meter measures a density of the base fluid and transmits a base fluid density measurement to the control system. A proppant (252) is then added to the base fluid to create a fracture fluid (202). The fracture fluid is then flowed through the Coriolis flow meter. The Coriolis flow meter measures a density of the fracture fluid and transmits a fracture fluid density measurement to the control system. The control system determines an amount of proppant in the fracture fluid based on the base fluid density measurement, the fracture fluid density measurement, and a density of the proppant.

Declaration under Rule 4.17:

as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent

(AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Published:

with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.